SPR 25-1

FOREST INSECT CONDITIONS

in the Pacific Northwest during 1964

by

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DIVISION OF TIMBER MANAGEMENT
PACIFIC NORTHWEST REGION
U.S. DEPARTMENT OF AGRICULTURE
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This is the 17th annual report of forest insect conditions in Oregon and Washington. It is based on cooperative surveys sponsored by the Northwest Forest Pest Action Council. Many individuals and organizations made these surveys possible. Special acknowledgement is made to the principal cooperators: Oregon State Department of Forestry and Washington State Department of Natural Resources.

On July 1, 1964, two U. S. Forest Service Zone Entomologists were moved to field stations, one at Seattle, Washington and one at Bend, Oregon. These entomologists handle insect and disease survey and control problems in their respective States.

COVER BACKGROUND: The Douglas-fir beetle, Dendroctonus pseudotsugae Hopk., a serious enemy of Douglas-fir in the Northwest.

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January 1965

Insect and Disease Control Branch
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Pacific Northwest Region U. S. Forest Service

U. S. Department of Agriculture

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SURVEY FINDINGS IN BRIEF

Forest insect outbreaks occurred on 1,208,570 acres this year, the lowest total since the surveys began in 1947 (table 1). The damage trend during the past decade is as follows:

Year	Acres infested	Year	Acres infested
1955	2,248,820	1960	1,272,960
1956	1,410,660	1961	1,223,230
1957	2,129,440	1962	1,305,170
1958	2,032,720	1963	1,319,125
1959	1,448,360	1964	1,208,570

The extent and intensity of outbreaks by insect species are given in table 39 for Oregon and in table 40 for Washington. The generalized location of the major outbreaks is shown in figure 1.

The principal findings in 1964 were:

1. Mountain pine beetle.--Tree killing increased in western white pine and lodgepole pine in Oregon and decreased in Washington. Losses increased in stagnated ponderosa pine stands in both States. Light to moderate outbreaks occurred in sugar pine stands in southern Oregon.

2. Fir engraver.--The infested area doubled in Oregon and remained static in Washington.

3. Western pine beetle.--Infestations increased in size in Oregon but decreased in Washington. Subepidemic tree killing increased in most ponderosa pine stands, indicating a possible beetle population build-up next year.

4. Douglas-fir beetle.--Moderate to heavy losses occurred in localized areas in southwestern Oregon Coast Range and in northeastern Oregon. Outbreaks decreased in size in Washington.

5. Oregon pine ips.--Outbreaks decreased significantly in Oregon but remained static in Washington pine stands.

6. Engelmann spruce beetle.--Infestations declined significantly in both States.

7. Silver fir beetles.--Outbreaks subsided completely in Oregon and decreased in Washington.

8. Balsam woolly aphid.--The infested acreage increased in Oregon and decreased in Washington. Most of the damage occurred in subalpine fir stands along the Cascades in both States.

9. Larch casebearer.--Infestations in northeastern Washington increased in size and became more severe. No control is recommended for 1965.

10. Douglas-fir tussock moth.--Outbreaks began to subside in northeastern Washington but increased in extent and severity in central Oregon on the Malheur and Ochoco National Forests. Control is necessary in Oregon in 1965 to prevent widespread tree mortality.

11. Noctuid moth.--Light to heavy defoliation of Douglas-fir occurred on about 8,000 acres on the Siuslaw National Forest in western Oregon.

12. Western oak looper.--Outbreaks in the Willamette Valley, Oregon decreased in size. A virus disease reduced larval populations at the older infestation centers. Some additional defoliation is likely to occur at newer centers in 1965.

13. Sawfly on larch.--Small outbreaks were centered on the Wallowa-Whitman and Mt. Hood National Forests in Oregon.

14. Pine needle miner.--Light to moderate defoliation of lodgepole pine occurred on the Deschutes National Forest, Oregon. Control is unnecessary in 1965.

15. Spruce budworm.--Light to heavy infestations occurred in northeastern Washington. For the first time since the early 1940's, no epidemic outbreaks occurred in Oregon.

16. Western hemlock looper.--Some light larval feeding occurred in southwestern Washington in areas left unsprayed in 1963. Tree recovery in sprayed areas was good.

17. European pine shoot moth.--No infestations were found outside the containment zone in Washington. Spread between communities within the zone has been slow. Spread within communities has been rapid. Three years' negative survey findings in Spokane indicate that the 1961 eradication was successful.

    In Portland, Oregon, 14 infested trees were found and destroyed. No other infestations were found in Oregon.

    Research is being planned on biological control of the shoot moth in the Northwest.

18. Cone and seed insects.--Insect damage to Douglas-fir cones and seeds varied from 2 percent to 100 percent. Western white pine cones sustained up to 70 percent seed loss due to insects. Damage in ponderosa pine varied from none to 92 percent.

Table 1.--Summary of 1964 forest insect epidemic infestations in Oregon and Washington

Insects 1/	Oregon		Washington		Regional total	
	Infestation centers	Area	Infestation centers	Area	Infestation centers	Area
	Number	Acres	Number	Acres	Number	Acres
Defoliators:						
Larch casebearer	0	0	63	112,910	63	112,910
Douglas-fir tussock moth	9	40,320	72	17,700	81	58,020
Noctuid moth (Douglas-fir)	2	8,440	0	0	2	8,440
Western oak looper	22	6,430	0	0	22	6,430
Unknown sawfly (larch)	3	2,680	0	0	3	2,680
Needleminer (lodgepole pine)	2	2,800	0	0	2	2,800
Spruce budworm	0	0	3	2,800	3	2,800
Western hemlock looper	0	0	8	650	8	650
All defoliators	38	60,670	146	134,060	184	194,730
Sucking insects:						
Balsam woolly aphid	327	148,040	88	35,380	415	183,420
All sucking insects	327	148,040	88	35,380	415	183,420
Bark beetles:						
Mountain pine beetle (W)	267	92,700	403	175,990	670	268,690
Mountain pine beetle (L)	175	55,790	15	8,770	190	64,560
Mountain pine beetle (P)	147	42,440	41	13,830	188	56,270
Mountain pine beetle (S)	12	6,160	0	0	12	6,160
Fir engraver	348	120,820	76	15,220	424	136,040
Western pine beetle	327	111,310	71	24,100	398	135,410
Douglas-fir beetle	1,461	130,300	121	18,110	1,582	148,410
Oregon pine ips	62	7,370	24	2,080	86	9,450
Engelmann spruce beetle	27	3,600	6	600	33	4,200
Silver fir beetles	0	0	6	1,230	6	1,230
All bark beetles	2,821	570,490	763	259,930	3,589	830,420
All insects	3,191	779,200	997	429,370	4,188	1,208,570

1/ Mountain pine beetle infestations are separated by tree species: W, western white pine; L, lodgepole pine; P, ponderosa pine; S, sugar pine.

INTRODUCTION

Epidemic infestations were detected, evaluated, and mapped as to intensity from the air. Ground surveys included intensive biological evaluation surveys to routine checking to verify the accuracy of aerial mapping. Individual insects are discussed below according to the extent of their outbreaks and not necessarily by their present or future destructiveness.

DEFOLIATORS

Standards used for mapping forest defoliator outbreaks are as follows:

Intensity	Appearance of Damage
Light	Barely visible from the air.
Moderate	Top 1/4 of tree defoliated.
Heavy	Top 1/2 of tree defoliated.
Very heavy	Top 3/4 of tree defoliated, some tree killing in progress.

LARCH CASEBEARER
Coleophora laricella (Hübner)

Outbreaks increased considerably in size and intensity in northeastern Washington (table 2). This is a part of the larger, more severe infestation centered in northern Idaho. The defoliation ranged from very light to extreme, but no tree mortality occurred. The heaviest outbreak centers were located near Spokane, Washington on Mica Peak and Mt. Spokane (table 3). Lighter infestations occurred in most larch stands from the Idaho line westward to Ford, Washington. We expect this insect to continue its westward spread to the Columbia River. No casebearer outbreak has been found in larch stands in Oregon.

An accelerated program for rearing and release of the parasite, *Agathis pumila*, was begun in Idaho this year to establish colonies of the parasite in infested areas. Spray tests in Idaho show that undiluted technical malathion applied at the rate of 8 ounces per acre gave excellent control.

Table 2.--Trend of epidemic larch casebearer infestations

Northeast Washington, 1960-64

(In acres)

Year	Intensity of infestation				All intensities
	Light	Moderate	Heavy	Very heavy	
1960	1,920	0	0	0	1,920
1961	0	0	0	0	0
1962	2,720	2,560	0	0	5,280
1963	21,940	3,750	6,440	4,900	37,030
1964	61,000	28,540	14,900	8,470	112,910

Table 3.--Extent of larch casebearer infestations

in Washington in 1964, by reporting area

and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation				All intensities
		Light	Moderate	Heavy	Very heavy	
	Number	Acres				
Washington:						
Northeast Washington (W.S.D.N.R.)	31	46,980	19,120	11,900	4,530	82,530
Kaniksu N.F.	31	13,820	9,420	3,000	3,940	30,180
Colville N.F.	1	200	0	0	0	200
Washington areas	63	61,000	28,540	14,900	8,470	112,910
Regional total	63	61,000	28,540	14,900	8,470	112,910

1/ N.F., National Forest; W.S.D.N.R., Washington State Department of Natural Resources

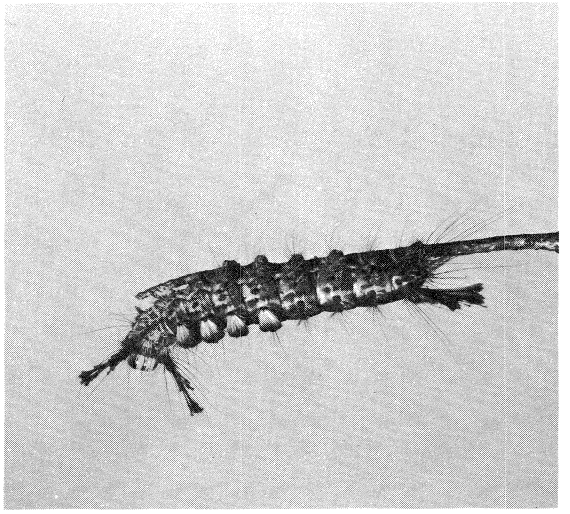
DOUGLAS-FIR TUSSOCK MOTH
Hemerocampa pseudotsugata McD.

Outbreaks increased in size and intensity in Oregon and Washington (table 4). Infestations were centered around Spokane and Colville in northeastern Washington (table 5). The size of infestations ranged from a few trees on farm woodlots to a thousand acres or more in young Douglas-fir stands. In 1964, landowners in the Coulee Creek drainage near Spokane sprayed about 300 acres with DDT to prevent extensive tree killing. More infested timber in this area may be sprayed in 1965 to save trees until natural control factors become effective. A virus disease decimated the larval populations at older infestation centers but not before serious tree killing occurred. The prognosis for 1965 is for lighter defoliation and less tree killing.

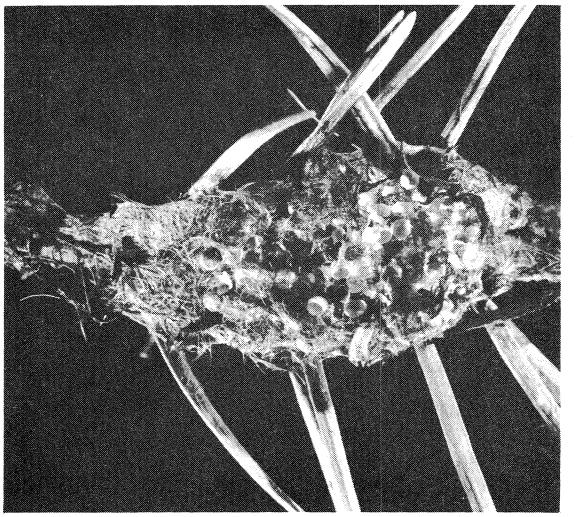
In Oregon, three large centers with severe tree damage developed on the Malheur National Forest near Antelope Mountain, King Mountain, and Gold Hill. Less extensive defoliation occurred in the Vance Creek drainage, south of John Day. At these centers, true firs and Douglas-fir were the chief hosts but pines and western larch in the understory were also defoliated to varying degrees. Defoliation ranged from light to very heavy. Some tree killing and top killing has already occurred and more is likely in 1965 unless the insect is controlled.

One center of light defoliation occurred on the Ochoco National Forest near Silver Springs. Most of the defoliation was on the overstory true firs and mature Douglas-firs. No tree killing has occurred at this center but conditions here are similar to those at Antelope Mountain on the Malheur National Forest the year before the current epidemic developed.

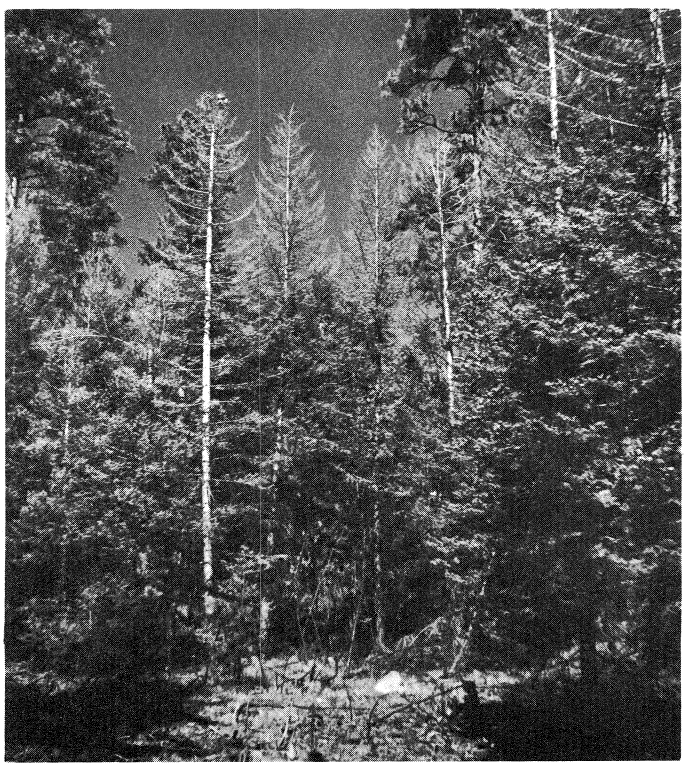
Biological evaluation surveys late in 1964 showed that natural factors such as a virus disease and insect parasites would not control the outbreak in 1965 early enough to prevent serious tree mortality. After visiting the area and weighing the cost-benefit values, the Northwest Forest Pest Action Council recommended aerial spraying with DDT until natural controls become effective.



Mature Douglas-fir tussock moth larva feeding on true fir foliage.



Hatched eggs on tussock moth cocoons.



Young true fir stand heavily defoliated by the Douglas-fir tussock moth.

Table 4.--Trend of Douglas-fir tussock moth infestations in Oregon and Washington, 1963-64

(In acres)

Year	Area of epidemic infestation		Regional total
	Oregon	Washington	
1963	0	1,515	1,515
1964	40,320	17,700	58,020

Table 5.--Extent of Douglas-fir tussock moth infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation				
		Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Malheur N.F.	4	23,560	6,160	6,050	3,190	38,960
Ochoco N.F.	5	1,360	0	0	0	1,360
Oregon areas	9	24,920	6,160	6,050	3,190	40,320
Washington:						
N.E. Washington (W.S.D.N.R.)	50	5,380	3,530	4,150	1,200	14,260
Colville N.F.	22	2,200	1,060	180	0	3,440
Washington areas	72	7,580	4,590	4,330	1,200	17,700
Regional total	81	32,500	10,750	10,380	4,390	58,020

1/ N.F., National Forest; W.S.D.N.R., Washington State Department of Natural Resources.

A NOCTUID ON DOUGLAS-FIR
Xylomyges simplex Wlk.

About 8,000 acres of Douglas-fir were defoliated in 1964 near Harlan, Oregon (table 6). Outbreaks of this noctuid moth are rare in the Pacific Northwest. Little is known about the insect's habits but it is apparently a solitary defoliator. Since this insect is generally kept under control by natural factors, no control is necessary for 1965. The trend of the infestation will be closely followed. overwinters as a pupa

Table 6.--Extent of Noctuid moth infestation in Oregon in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon						
Siuslaw N.F.	2	0	8,440	0	0	8,440
Oregon areas	2	0	8,440	0	0	8,440
Regional total	2	0	8,440	0	0	8,440

1/ N.F., National Forest.

Another noctuid was associated. *Achytonix epipaschia* Grt. This one is green w/dark stripes. - overwinters as a larva?

SAWFLY ON LARCH
Neodiprion sp.

Western larch stands in Oregon were lightly to heavily defoliated by an unknown sawfly in 1964 (table 7). The largest infestation center occurred on the Mt. Hood National Forest in Barlow Creek, Bonney Creek, and White River drainages. Ground checks revealed the pupae were heavily parasitized. Smaller infestation centers continued on the Wallowa-Whitman National Forest in Bear Creek and Sturgill Creek drainages. No tree killing was observed on either Forest. Apparently western larch can tolerate some defoliation for a few seasons without any lasting stand damage.

The trend of this year's population will be closely followed. No control is needed in 1965.

Table 7.--Extent of sawfly on larch in Oregon in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Mt. Hood N.F.	1	2,520	0	0	0	2,520
Wallowa-Whitman N.F.	2	160	0	0	0	160
Oregon areas	3	2,680	0	0	0	2,680
Regional total	3	2,680	0	0	0	2,680

1/ N.F., National Forest.

UNKNOWN NEEDLE MINER ON LODGEPOLE PINE

Defoliation of lodgepole pine by a needle miner, probably Recurvaria sp., occurred near the Wickiup and Crane Prairie Reservoirs, Deschutes National Forest, Oregon (table 8). No tree killing is anticipated, but continued defoliation next year may weaken the trees so that they will become attractive to bark beetles. The trend is not known, but will be followed closely. Control is not necessary in 1965.

Table 8.--Extent of needle miner infestation in lodgepole pine in Oregon in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Deschutes N.F.	2	0	2,800	0	0	2,800
Oregon areas	2	0	2,800	0	0	2,800
Regional total	2	0	2,800	0	0	2,800

1/ N.F., National Forest.

SPRUCE BUDWORM

Choristoneura fumiferana (Clem.)

Epidemic outbreaks of the spruce budworm were at the lowest level since the beginning of record keeping in 1947. Defoliation declined in both States (table 9). No epidemic outbreaks were recorded in Oregon; however, subepidemic populations were found on the Fremont National Forest and other southern Oregon forest areas during the annual spruce budworm egg mass evaluation survey. The predicted population trend for this area is downward to static. Infestations in Washington were centered on the Kaniksu National Forest but defoliation was less severe than last year. In addition to the Kaniksu outbreak, a new small outbreak developed on Deadman Hill southwest of Colville (table 10).

Table 9.--Trend of spruce budworm infestations in Oregon and Washington, 1960-64

(In acres)

Year	Area of epidemic infestations		Regional total
	Oregon	Washington	
1960	264,560	20,960	285,520
1961	55,200	29,600	84,000
1962	48,370	0	48,370
1963	49,040	10,200	59,240
1964	0	2,800	2,800

Table 10.--Extent of spruce budworm infestations in Washington in 1964 by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Washington:						
Kaniksu N.F.	1	1,310	440	310	0	2,060
Colville N.F.	2	230	510	0	0	740
Washington areas	3	1,540	950	310	0	2,800
Regional total	3	1,540	950	310	0	2,800

1/ N.F., National Forest.

WESTERN HEMLOCK LOOPER

Lambdina fiscellaria lugubrosa Hulst

Severe infestations of the hemlock looper subsided completely in Oregon and decreased in severity and extent in Washington (table 11). Timely aerial spray programs are credited with controlling the outbreaks. The few remaining isolated centers of light and moderate defoliation were on Long Island, Bear River, Finn Creek, and South Nemah River in southwestern Washington (table 12). These infestations are expected to decline naturally; hence, no control is needed in 1965.

Table 11.--Trend of western hemlock looper infestations in Oregon and Washington, 1961-64

(In acres)

Year	Area of epidemic infestations		Regional total
	Oregon	Washington	
1961	11,000	0	11,000
1962	1,060	5,990	7,050
1963	540	8,040	8,580
1964	0	650	650

Table 12.--Extent of Western hemlock looper infestations in Washington in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Washington:						
Southwest Washington (W.S.D.N.R.)	8	330	320	0	0	650
Washington areas	8	330	320	0	0	650
Regional total	8	330	320	0	0	650

1/ W.S.D.N.R., Washington State Department of Natural Resources.

WESTERN OAK LOOPER

Lambdina fiscellaria sominiaria (Hulst)

The extent of the outbreak decreased this year (table 13). Defoliation of Oregon white oak and Oregon ash occurred near Wren, Willamina, McMinnville, Yamhill, and other widely scattered areas in the Willamette Valley of Oregon (table 14). No control is necessary in 1965 since these outbreaks seldom persist in an area long enough to cause tree mortality. Usually infested trees will refoliate later in the season after the larvae have completed their feeding. Apparently a virus disease is controlling the larvae populations in the older infestation centers. Some spread and development of new infestation centers is expected in 1965 followed by a gradual decrease in intensity and extent of damage.

Table 13.--Trend of western oak looper infestation in Oregon, 1960-64

(In acres)

Year	Intensity of infestation				All intensities
	Light	Moderate	Heavy	Very heavy	
1960	0	0	0	2,080	2,080
1961	0	5,760	960	160	6,880
1962	1,240	0	0	0	1,240
1963	6,120	3,990	4,760	1,880	16,750
1964	5,670	640	120	0	6,430

Table 14.--Extent of western oak looper in Oregon in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Siuslaw N.F.	22	5,670	640	120	0	6,430
Oregon areas	22	5,670	640	120	0	6,430
Regional total	22	5,670	640	120	0	6,430

1/ N.F., National Forest.

EUROPEAN PINE SHOOT MOTH

Rhyacionia buoliana (Schiff.)

A containment zone was established in the Puget Sound area of Washington soon after the discovery of the moth at Bellevue in 1959. The purpose of the zone is to prevent spread of the infestation by movement of infested stock. Each year, surveys have been made both inside and outside of the containment zone to detect new outbreaks of the shoot moth. Spread of the shoot moth infestation between communities in the containment zone has been slow, but stead--mostly by movement of infested trees. Its spread within infested communities has been rapid by movement of infested stock as well as by moth flight.

In Washington 41 communities outside the containment zone were surveyed but no European pine shoot moth infestations were found. With the exception of a few trees in Portland, no infested pines were found in the 63 communities surveyed in Oregon in 1964.

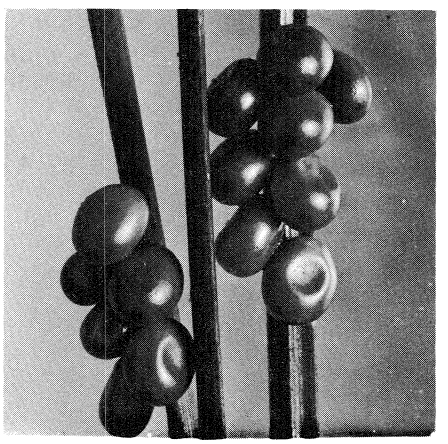
Negative survey findings for the third successive year in Spokane, Washington indicate the 1961 eradication operation was successful. Spokane, Washington is considered free of the shoot moth and Spokane County should be removed from the list of quarantined counties in Washington.

During 1964 eradication surveys in Portland, Oregon, 14 infested pines were discovered and destroyed before moth flight. Thirteen of the trees were within a one-half mile circle in a southeast Portland neighborhood and the other was about two miles east in a city park. Some of the infested trees were tall and the infestations had been overlooked during earlier surveys. Infestations on the smaller pines probably developed in 1963. Eradication surveys will be continued in Portland, Oregon until the European pine shoot moth threat has been eliminated.

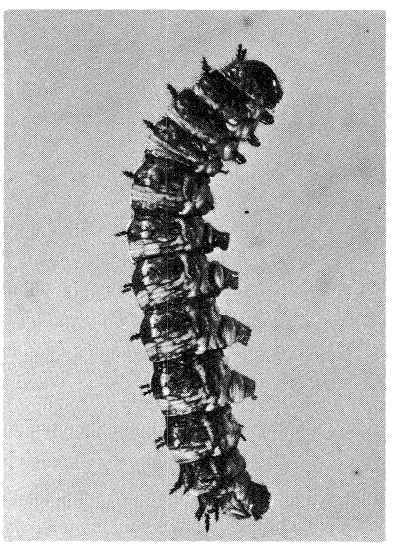
PANDORA MOTH

Coloradia pandora Blake

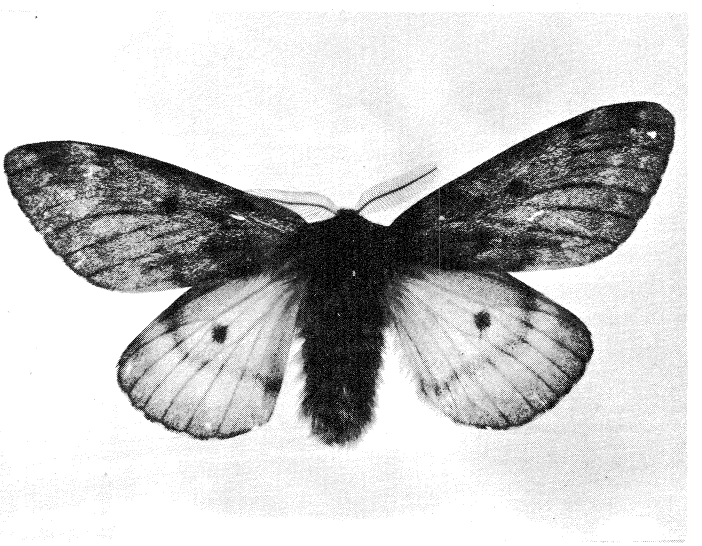
Mass moth flights were attracted to lighted store fronts at Chemult, Oregon, late in August. Eggs were deposited on signs, posts, shingles, and windows. Subsequent evaluation surveys in nearby lodgepole pine stands showed that egg laying had been light and feeding damage by first-year larvae was insignificant. This feeding was confined to less than 1,000 acres. Feeding by the second-year larvae is expected to be somewhat heavier in 1965, but not severe enough to warrant control. Tests are being made at the U. S. Forest Service Pesticide Evaluation Unit at Berkeley, California to find effective, but less persistent insecticides for control of the pandora moth and other forest defoliators. If such an insecticide is found, a pilot spray test may be undertaken against the pandora moth in 1965.



Pandora moth eggs on a pine needle.



Pandora moth larva



Pandora moth adult

OTHER DEFOLIATORS

The pine needle-sheath miner, Zellaria haimbachi Busck, was fairly common on various pines in Oregon and Washington, but caused no serious damage. Flights of western phantom hemlock looper, Nepytia phantasmaria (Strech), were heavy in east Portland, Oregon late in the fall. Egg deposition on Douglas-fir was heavy. The rusty spotted tussock moth, Orgyia antiqua (L.), defoliated huckleberry and other low browse plants over wide areas on the Chesnimnus Ranger District, Wallowa-Whitman National Forest, Oregon. A virus disease was present and egg parasites were abundant. Mountain mahogany on extensive areas on and near the Malheur and Ochoco National Forests in Central Oregon was lightly to heavily defoliated by a caterpillar, Ethmia discostigella (Chamb.). None of the mountain mahogany was killed but the amount of browse available for winter game use was reduced.

BALSAM WOOLLY APHID

Chermes piceae (Ratz)

Outbreaks of the balsam woolly aphid on true firs increased in Oregon but decreased significantly in Washington (table 15). Tree killing occurred in grand fir, Pacific silver fir, and subalpine fir stands.

The most extensive subalpine fir mortality occurred on the Willamette, Rogue River, Umpqua, Mt. Hood and Deschutes National Forests in Oregon. The insect has become well established in the southern Oregon Cascades, at Crater Lake National Park and tributary streams of the upper Rogue River (table 16). In the Coast Range, infestations have spread southward and are now found near Coquille, Oregon in grand fir stands.

In Washington mortality was most extensive on subalpine fir on Gifford Pinchot and Snoqualmie National Forests (table 16).

Control of the aphid by predators has been tested for several years with discouraging results. Chemical control is impractical under forest conditions except at high value recreational and scenic areas. About all that can be done is to harvest all merchantable infested trees and recently dead trees to save timber values that might otherwise be lost.

Table 15.--Trend of balsam woolly aphid infestations in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	66,440	760	67,200
1961	78,080	2,320	80,400
1962	51,800	4,710	56,510
1963	102,145	85,310	187,455
1964	148,040	35,380	183,420

Table 16.--Extent of balsam woolly aphid infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Willamette N.F.	136	63,200	8,680	880	0	72,760
Rogue River N.F.	16	14,760	2,720	1,120	160	18,760
Umpqua N.F.	42	12,640	3,410	1,810	100	17,960
Mt. Hood N.F.	58	15,400	2,260	0	0	17,660
Deschutes N.F.	54	8,240	7,600	1,480	0	17,320
Warm Springs I.R.	7	1,380	0	0	0	1,380
Crater Lake N.P.	8	920	400	0	0	1,320
Coos District (O.S.D.F.)	3	280	240	0	0	520
Siuslaw N.F.	1	340	0	0	0	340
Northwest Oregon (O.S.D.F.)	2	20	0	0	0	20
Oregon areas	327	117,180	25,310	5,290	260	148,040
Washington:						
Gifford Pinchot N.F.	53	17,900	5,560	2,400	0	25,860
Snoqualmie N.F.	24	4,320	1,320	160	0	5,800
Mt. Rainier N.P.	6	640	0	480	0	1,120
Southwest Washington (W.S.D.N.R.)	1	1,040	0	0	0	1,040
Yakima I.R.	2	440	400	0	0	840
Wenatchee N.F.	2	720	0	0	0	720
Washington areas	88	25,060	7,280	3,040	0	35,380
Regional total	415	142,240	32,590	8,330	260	183,420

1/ N.F., National Forest; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry.

BARK BEETLES

The intensity of a bark beetle infestation is based upon the number of trees infested per section and the number of infested trees in a group, as shown below:

Timber type	Infestation intensity							
	Light		Moderate		Heavy		Very heavy	
	Trees per section	Trees per group	Trees per section	Trees per group	Trees per section	Trees per group	Trees per section	Trees per group
	- - - - Number - - - -							
Ponderosa pine	20-50	5	50-100	10	100-200	20	200+	20+
Lodgepole pine and western white pine	50-350	50	350-1,000	200	1,000-2,600	400	2,600+	400+
Douglas-fir	20-50	5	50-100	15	150-300	30	300+	30+
True firs, Engelmann spruce, and western white pine	20-50	5	50-100	15	150-300	30	300+	30+

DOUGLAS-FIR BEETLE

Dendroctonus pseudotsugae Hopk.

Douglas-fir beetle damage in Oregon was considerably higher in 1964 than in 1963, and reached an all-time low in Washington (table 26).

The trend of the Douglas-fir beetle outbreaks in Oregon is upward. The largest and most severe outbreak occurred in northeast Oregon on the Wallowa-Whitman National Forest (table 27). As anticipated in 1963, a widespread epidemic developed in the Douglas-fir stands of western Oregon. An estimated 250 to 500 million board feet of timber has been killed and more losses are expected in 1965. In 1964, losses were particularly heavy on the Siskiyou and Siuslaw National Forests and in Lane, Coos, and Douglas Counties. Damage was light elsewhere. In Washington, the trend is downward. The anticipated outbreak in western Washington failed to materialize. Tree killing on the West Side Washington Forests was very low (table 27). The majority of the beetle damage occurred in eastern Washington on or near the Okanogan and Colville National Forests.

Removal of all infested trees from the woods is essential to minimize future beetle attacks and deterioriation of the timber. This can be accomplsihed efficiently by salvage logging. In conjunction with the regular salvage program, there is reason to believe that trap trees might be of benefit in absorbing attacking beetles in the spring of 1965. Efficacy of this method of combatting the Douglas-fir beetle has not been tested experimentally in the Northwest.

Douglas-fir Beetle Gallery

Much of the windthrow resulting from the 1962 Columbus Day storm and subsequent storms is still attractive and may be attacked by the Douglas-fir beetle in 1965. All accessible windthrow should be removed from the woods as quickly as possible to minimize the beetle buildup.

Table 26.--Trend of Douglas-fir beetle infestations in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of epidemic infestations		Regional total
	Oregon	Washington	
1960	114,160	104,440	218,600
1961	70,120	99,140	169,260
1962	26,540	55,990	82,530
1963	24,545	60,700	85,245
1964	112,190	18,110	130,300

MOUNTAIN PINE BEETLE

Dendroctonus ponderosae Hopk.

Regionwide, the total infested acreage in western white pine, lodgepole pine, and ponderosa pine decreased substantially but increased in sugar pine stands (table 17). Heavy tree killing resulted at several localities. The situation by tree species is as follows:

Western white pine.--The mountain pine beetle continued to cause heavy losses in western white pine stands in both Washington and Oregon. The majority of the tree killing occurred in inaccessible, wilderness, and other dedicated areas.

Although a definite downward trend occurred in Washington, losses remained high. The heaviest damage occurred on the Olympic National Park and the Gifford Pinchot, Snoqualmie, and Wenatchee National Forests (table 18). Tree killing persisted on all forests in the Cascade Range and on the Olympic Peninsula.

In Oregon, losses increased over last year's total (table 17). Most of this year's tree killing centered on the Willamette, Mt. Hood, Siskiyou, and Umpqua National Forests. Subepidemic losses were observed on forests along the Cascade Mountains.

Lodgepole pine.--Mortality in lodgepole pine stands increased slightly in Oregon and decreased in Washington resulting in a static overall loss (table 17). The heavier losses occurred on the Fremont, Winema, and Deschutes National Forests in Oregon, and on the Colville and Okanogan National Forests of Washington (table 19).

Ponderosa pine.--Attacks in young stagnated ponderosa pine stands increased considerably in Oregon and Washington. The heaviest loss occurred on the Wallowa-Whitman National Forest in Oregon. Additional losses were centered on the Malheur and Umatilla National Forests in Oregon and on the Okanogan and Colville National Forests in Washington (table 20).

Sugar pine.--Light to moderate tree killing occurred in mature sugar pine stands of Southern Oregon. Most losses were reported on the Siskiyou National Forest and on the Bureau of Land Management's Roseburg District in Douglas County (table 21).

Control.--Control is impractical in western white pine in the Cascade Mountains because of the scattered occurrence of white pine, economy of logging, and prevalence of blister rust. To reduce beetle populations and save timber values, salvaging of merchantable infested trees is encouraged.

Maintenance control of the beetle in lodgepole pine stands was done in Crater Lake National Park in 1964. Control will be done as necessary in 1965.

In unmerchantable, stagnated ponderosa pine stands, thinning is recommended to improve growth and reduce beetle hazard. Vigorous, well-spaced trees appear to be less susceptible to attack. Merchantable beetle-infested sugar pine should be logged before the beetles fly to aid in reducing the beetle population and save timber values that would otherwise be lost.

Table 17.--Trend of mountain pine beetle infestations in Oregon and Washington, by host species, 1960-64 1/

(In acres)

Year of detection	Area of epidemic infestations							Regional total, all species
	Oregon				Washington			
	W	L	P	S	W	L	P	
1960	31,040	40,080	14,520	480	209,400	6,440	4,740	306,700
1961	114,380	77,680	16,640	0	291,760	1,520	1,200	503,180
1962	73,720	65,200	3,820	160	349,770	3,050	1,340	497,060
1963	67,845	50,220	32,220	0	410,540	17,620	1,160	579,605
1964	92,700	55,790	42,440	6,160	175,990	8,770	13,830	395,680

1/ Host species are: W, western white pine; L, lodgepole pine; P, ponderosa pine; S, sugar pine.

Table 18.--Extent of mountain pine beetle in western white pine in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Willamette N.F.	137	20,720	13,200	8,800	720	43,440
Mt. Hood N.F.	76	21,420	12,540	2,860	0	36,820
Umpqua N.F.	38	5,990	80	0	0	6,070
Siskiyou N.F.	3	4,340	0	0	0	4,340
Deschutes N.F.	9	1,200	0	440	0	1,640
Warm Springs I.R.	2	200	0	0	0	200
Rogue River N.F.	2	190	0	0	0	190
Oregon areas	267	54,060	25,820	12,100	720	92,700
Washington:						
Olympic N.P.	61	39,730	12,110	4,790	640	57,270
Gifford Pinchot N.F.	55	16,880	10,870	3,550	0	31,300
Snoqualmie N.F.	53	16,120	4,920	1,360	240	22,640
Wenatchee N.F.	98	11,860	4,800	3,860	120	20,640
Olympic N.F.	31	7,830	6,020	1,840	180	15,870
Kaniksu N.F.	24	7,320	2,970	150	0	10,440
Colville N.F.	11	1,640	1,000	1,050	0	3,690
Mt. Baker N.F.	36	1,590	920	1,760	0	4,270
Mt. Rainier N.P.	18	1,480	1,000	1,440	320	4,240
Quinault I.R.	3	2,050	0	130	0	2,180
N.W. Washington (W.S.D.N.R.)	3	1,420	140	0	0	1,560
Yakima I.R.	5	240	240	560	0	1,040
N.E. Washington (W.S.D.N.R.)	4	720	0	0	0	720
Okanogan N.F.	1	130	0	0	0	130
Washington areas	403	109,010	44,990	20,490	1,500	175,990
Regional total	670	163,070	70,810	32,590	2,220	268,690

1/ N.F., National Forest; I.R., Indian Reservation; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources.

Table 19.--Extent of mountain pine beetle in lodgepole pine in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Fremont N.F.	54	12,430	7,420	2,100	0	21,950
Winema N.F.	55	8,310	6,410	1,660	720	17,100
Deschutes N.F.	26	2,670	5,660	770	0	9,100
Malheur N.F.	15	320	1,240	500	0	2,060
Crater Lake N.P.	8	1,880	120	0	0	2,000
Wallowa-Whitman N.F.	5	1,360	0	0	80	1,440
Rogue River N.F.	3	1,100	0	0	0	1,100
Umatilla N.F.	4	530	0	0	0	530
Siskiyou N.F.	2	190	0	0	0	190
Umpqua N.F.	2	160	0	0	0	160
Willamette N.F.	1	0	0	0	160	160
Oregon areas	175	28,950	20,850	5,030	960	55,790
Washington:						
Colville N.F.	3	670	1,130	1,740	0	3,540
Okanogan N.F.	6	1,100	790	280	0	2,170
Wenatchee N.F.	2	1,120	680	0	0	1,800
Colville I.R.	1	0	180	0	0	180
Gifford Pinchot N.F.	2	680	200	0	0	880
Yakima I.R.	1	0	200	0	0	200
Washington areas	15	3,570	3,180	2,020	0	8,770
Regional total	190	32,520	24,030	7,050	960	64,560

1/ N.F., National Forest; I. R., Indian Reservation; N.P., National Park.

Table 20.--Extent of mountain pine beetle in ponderosa pine in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	48	12,360	5,160	2,320	1,560	21,400
Malheur N.F.	23	3,770	1,540	1,420	0	6,730
Umatilla N.F.	20	4,330	350	0	0	4,680
Fremont N.F.	15	1,500	1,320	100	0	2,920
Rogue River N.F.	5	1,760	0	0	80	1,840
Siskiyou N.F.	15	1,480	120	0	0	1,600
Ochoco N.F.	9	1,340	0	0	0	1,340
Winema N.F.	3	890	0	20	0	910
Central Oregon (O.S.D.F.)	1	520	0	0	0	520
Crater Lake N.P.	1	200	0	0	0	200
Deschutes N.F.	3	120	0	0	0	120
Umatilla I.R.	1	80	0	0	0	80
Warm Springs I.R.	2	70	0	0	0	70
Mt. Hood N.F.	1	30	0	0	0	30
Oregon areas	147	28,450	8,490	3,860	1,640	42,440
Washington:						
Okanogan N.F.	16	2,660	2,050	1,540	230	6,480
Colville N.F.	6	690	0	1,840	0	2,530
Colville I.R.	8	2,070	0	0	0	2,070
Umatilla N.F.	5	1,270	0	0	0	1,270
Yakima I.R.	2	520	160	0	0	680
Glenwood District (W.S.D.N.R.)	2	520	0	0	0	520
Gifford Pinchot N.F.	1	160	0	0	0	160
Wenatchee N.F.	1	0	0	0	120	120
Washington areas	41	7,890	2,210	3,380	350	13,830
Regional total	188	36,340	10,700	7,240	1,990	56,270

1/ N.F., National Forest; I.R., Indian Reservation; N.P., National Park, O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Natural Resources.

Table 21.--Extent of mountain pine beetle in sugar pine in Oregon in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Coos District (O.S.D.F.)	2	80	4,520	0	0	4,600
Siskiyou N.F.	6	1,030	0	0	0	1,030
Rogue River N.F.	3	490	0	0	0	490
Deschutes N.F.	1	40	0	0	0	40
Regional total	12	1,640	4,520	0	0	6,160

1/ N.F., National Forest; O.S.D.F., Oregon State Department of Forestry.

Stagnated ponderosa pine stands such as this are prime targets for mountain pine beetle attacks.

Dense young ponderosa pines on the Wallowa-Whitman N.F., Oregon, killed by the mountain pine beetle.

FIR ENGRAVER

Scolytus ventralis Lec.

Epidemic outbreaks of the fir engraver in Washington remained static, but in Oregon, the acreage of true fir stands infested doubled in 1964 (table 22). The heaviest losses occurred on the Fremont, Wallowa-Whitman, Umatilla, and Ochoco National Forests (table 23). Most losses in Washington occurred on the Umatilla, Okanogan, Kaniksu, and Wenatchee National Forests (table 23). The infestations on Lookout Mountain and Steens Mountain in Oregon occurred in fir stands isolated by several miles from other firs. Beetle attacks in these limited stands will seriously deplete the fir.

Much of the damage occurred in overmature trees and decadent stands. Outbreaks generally develop during periods of drought and subside rapidly when moisture conditions return to normal. Since the beetle will attack some trees and produce broods without killing the tree, detection of all infestations is very difficult and makes direct control impractical. Salvage of the infested trees is recommended to recover timber values that would otherwise be lost.

Table 22.--Trend of fir engraver infestations in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of epidemic infestations		Regional total
	Oregon	Washington	
1960	27,240	14,680	41,920
1961	43,720	17,800	61,520
1962	105,450	22,820	128,270
1963	58,280	15,865	74,145
1964	120,820	15,220	136,040

Table 23.--Extent of fir engraver beetle infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Fremont N.F.	62	29,690	8,400	960	0	39,050
Wallowa-Whitman N.F.	89	29,560	6,560	0	0	36,120
Umatilla N.F.	111	21,940	1,660	440	0	24,040
Ochoco N.F.	36	9,490	440	0	0	9,930
Malheur N.F.	19	2,480	2,610	0	0	5,090
Winema N.F.	8	2,110	1,130	0	160	3,400
Rogue River N.F.	7	1,170	0	0	0	1,170
Central Oregon (O.S.D.F.)	6	510	200	0	0	710
Lookout Mtn. (B.L.M.)	2	480	0	0	0	480
Deschutes N.F.	3	50	240	0	0	290
Steens Mtn. (B.L.M.)	1	200	0	0	0	200
Umatilla I.R.	2	180	0	0	0	180
Mt. Hood N.F.	1	120	0	0	0	120
Crater Lake N.P.	1	40	0	0	0	40
Oregon areas	348	98,020	21,240	1,400	160	120,820
Washington:						
Umatilla N.F.	15	4,000	0	0	0	4,000
Okanogan N.F.	18	2,970	540	0	0	3,510
Wenatchee N.F.	26	1,820	1,040	0	0	2,860
Kaniksu N.F.	7	2,510	330	0	0	2,840
Snoqualmie N.F.	3	840	0	0	0	840
Colville N.F.	3	230	260	0	0	490
Yakima I.R.	1	320	0	0	0	320
Mt. Baker N.F.	2	0	280	0	0	280
Colville I.R.	1	80	0	0	0	80
Washington areas	76	12,770	2,450	0	0	15,220
Regional total	424	110,790	23,690	1,400	160	136,040

1/ N.F., National Forest; N.P., National Park; I.R., Indian Reservation; B.L.M., Bureau of Land Management; O.S.D.F., Oregon State Department of Forestry.

WESTERN PINE BEETLE

Dendroctonus brevicomis Lec.

The area infested by the western pine beetle increased slightly in Oregon and decreased in Washington (table 24). The most extensive tree mortality this year occurred on the Malheur, Ochoco, and Fremont National Forests in Oregon and on the Yakima Indian Reservation and Okanogan and Gifford Pinchot National Forests in Washington (table 25). Elsewhere in pine areas of both States, an increase in subepidemic losses was noted, indicating a possible increase in Region-wide losses next year.

The intensity of tree mortality varied from light to very heavy in Oregon and Washington.

Losses caused by this beetle can be reduced or held to a minimum by continuing aggressive sanitation-salvage logging programs in all high-risk uncut stands.

Table 24.--Trend of western pine beetle infestations in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	142,520	18,300	160,820
1961	180,040	12,760	192,800
1962	392,385	6,380	398,765
1963	98,395	39,275	137,670
1964	111,310	24,100	135,410

Table 25.--Extent of western pine beetle infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Malheur N.F.	107	37,730	2,010	2,150	290	42,180
Ochoco N.F.	52	16,870	0	0	0	16,870
Fremont N.F.	40	10,110	5,880	0	0	15,990
Winema N.F.	26	9,790	170	0	0	9,960
Umatilla N.F.	37	8,170	0	0	0	8,170
Wallowa-Whitman N.F.	18	5,480	0	0	0	5,480
Deschutes N.F.	19	3,010	2,000	0	0	5,010
Siskiyou N.F.	10	3,120	0	0	0	3,120
Coos District (O.S.D.F.)	7	2,170	0	0	0	2,170
Rogue River N.F.	3	1,180	0	0	0	1,180
Umpqua N.F.	3	140	600	0	0	740
Warm Springs I.R.	5	440	0	0	0	440
Oregon areas	327	98,210	10,660	2,150	290	111,310
Washington:						
Yakima I.R.	21	9,520	960	0	0	10,480
Okanogan N.F.	10	2,970	840	0	0	3,810
Gifford Pinchot N.F.	4	2,400	0	0	0	2,400
Colville I.R.	9	2,120	0	0	0	2,120
Wenatchee N.F.	14	1,660	80	0	0	1,740
Spokane I.R.	4	950	330	0	0	1,280
Colville N.F.	3	260	510	150	0	920
Glenwood District (W.S.D.N.R.)	4	840	0	0	0	840
Umatilla N.F.	2	510	0	0	0	510
Washington areas	71	21,230	2,720	150	0	24,100
Regional total	398	119,440	13,380	2,300	290	135,410

1/ N.F., National Forest; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Forestry.

Table 27.--Extent of Douglas-fir beetle infestation in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	201	31,960	16,060	4,200	0	52,220
Coos District (O.S.D.F.)	601	13,970	3,500	1,960	200	19,630
Umatilla N.F.	73	9,400	1,240	0	0	10,640
Siskiyou N.F.	141	5,610	740	330	80	6,760
Umpqua N.F.	9	2,360	0	0	0	2,360
Malheur N.F.	8	680	130	0	0	810
Willamette N.F.	7	640	80	0	0	720
Ochoco N.F.	3	470	0	0	0	470
Mt. Hood N.F.	5	450	0	0	0	450
Rogue River N.F.	2	240	0	0	0	240
Siuslaw N.F.	290	17,790	100	0	0	17,890
Oregon areas:	1,340	83,570	21,850	6,490	280	112,190
Washington:						
Okanogan N.F.	36	6,450	380	0	0	6,830
Colville N.F.	26	2,530	1,900	200	0	4,630
Umatilla N.F.	23	2,710	0	0	0	2,710
Colville I.R.	13	1,460	590	0	0	2,050
Wenatchee N.F.	7	480	280	0	0	760
Gifford Pinchot N.F.	5	460	0	0	0	460
Kaniksu N.F.	8	230	130	0	0	360
Snoqualmie N.F.	2	230	0	0	0	230
Olympic N.P.	1	80	0	0	0	80
Washington areas:	121	14,630	3,280	200	0	18,110
Regional total	1,461	98,200	25,130	6,690	280	130,300

1/ N.F., National Forest; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry, N.P., National Park.

OREGON PINE IPS

Ips pini Say

Infestations of Oregon pine ips were generally downward over the region. A substantial decline in infested acreage occurred in Oregon and a small decline occurred in Washington, (table 28). The largest losses occurred on or near the Malheur, Winema, Mt. Hood, and Rogue River National Forests in Oregon. In Washington, the majority of the damage was centered on the drier sites on and near the Colville National Forest, Spokane and Colville Indian Reservations, and Glenwood District (W.S.D.N.R.) (table 29).

No controls are needed for 1965. Proper handling of logging and thinning slash will minimize population buildups and subsequent tree killing.

Table 28.--Trend of Oregon pine ips infestations in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	38,160	3,360	41,520
1961	15,880	7,560	23,440
1962	43,610	1,970	45,580
1963	15,580	2,600	18,180
1964	7,370	2,080	9,450

Table 29.--Extent of Oregon pine ips infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number			Acres		
Oregon:						
Malheur N.F.	17	710	550	550	390	2,200
Winema N.F.	9	840	700	0	280	1,820
Mt. Hood N.F.	7	950	50	0	0	1,000
Rogue River N.F.	3	880	0	0	0	880
Ochoco N.F.	6	740	0	0	0	740
Fremont N.F.	4	340	0	200	0	540
Deschutes N.F.	4	150	0	0	0	150
Wallowa-Whitman N.F.	12	40	0	0	0	40
Oregon areas	62	4,650	1,300	750	670	7,370
Washington:						
Colville I.R.	7	410	330	0	0	740
Glenwood District (W.S.D.N.R.)	4	520	0	0	0	520
Colville N.F.	3	330	0	0	0	330
Spokane I.R.	4	150	50	0	0	200
Wenatchee N.F.	2	80	80	0	0	160
Umatilla N.F.	3	120	0	0	0	120
Snoqualmie N.F.	1	10	0	0	0	10
Washington areas	24	1,620	460	0	0	2,080
Regional total	86	6,270	1,760	750	670	9,450

1/ N.F., National Forest; I.R., Indian Reservation; W.S.D.N.R., Washington State Department of Natural Resources.

ENGELMANN SPRUCE BEETLE
Dendroctonus obesus (Mann.)

The trend of tree killing by Engelmann spruce beetle was downward in both States. Decreases in acreage were moderate in Oregon and sharply downward in Washington (table 30). Light to moderate tree killing occurred on or near the Wallowa-Whitman and Umatilla National Forests in Oregon. In Washington, the Okanogan and Umatilla National Forests received light tree killing (table 31). In most cases the outbreak centers are located in inaccessible areas; hence, direct control is impractical. However, in accessible areas, salvage of currently infested trees of merchantable size is recommended.

Table 30.--Trend of Engelmann spruce beetle infestations in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	1,840	3,120	4,960
1961	2,560	5,000	7,560
1962	1,230	6,280	7,510
1963	4,115	11,015	15,130
1964	3,600	600	4,200

Table 31.--Extent of Engelmann spruce beetle infestations in Oregon and Washington in 1964, by reporting area and intensity of infestation

Reporting area 1/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Wallowa-Whitman N.F.	21	2,160	600	0	0	2,760
Umatilla N.F.	6	780	60	0	0	840
Oregon areas	27	2,940	660	0	0	3,600
Washington:						
Umatilla N.F.	3	320	0	0	0	320
Okanogan N.F.	3	280	0	0	0	280
Washington areas	6	600	0	0	0	600
Regional total	33	3,540	660	0	0	4,200

1/ N.F., National Forest.

SILVER FIR BEETLES
Pseudohylesinus spp.

For the second successive year no outbreaks of silver fir beetles occurred in Oregon. In Washington, losses were considerably less than in 1963 (table 32). Small patches of light to moderate tree killing occurred on the Mt. Baker and Snoqualmie National Forests and in the Olympic National Park (table 33). Subepidemic losses were scattered throughout many of the Pacific silver fir stands of western Washington, indicating a possible upward trend for next year.

No control other than removal of merchantable infested trees is recommended for 1965.

Table 32.--Trend of silver fir beetle infestations in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of epidemic infestation		Regional total
	Oregon	Washington	
1960	0	3,120	3,120
1961	480	3,040	3,520
1962	480	0	480
1963	0	54,840	54,840
1964	0	1,230	1,230

Table 33.--Extent of silver fir beetle infestations in Washington in 1964, by reporting area and intensity of infestation

Reporting area[1/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Washington:						
Snoqualmie N.F.	4	560	0	0	0	560
Mt. Baker N.F.	1	0	520	0	0	520
Olympic N.P.	1	150	0	0	0	150
Washington areas	6	710	520	0	0	1,230
Regional total	6	710	520	0	0	1,230

1/ N.F., National Forest; N.P., National Park

Pityophthorus idoneus Blk. reported for first time on Douglas-fir in vicinity of Salem, Oregon, by Ernie Pearson. Killing twigs on mature and immature trees.

Bark beetles - in flight October 10, 1964 Warm Springs Indian Reservation.

DYING HEMLOCK

Mature western hemlock dying from unknown causes was restricted to Washington Forests this year (table 34) where the heaviest damage was recorded on or near Mt. Baker and Olympic National Forests and in Olympic National Park (table 35).

Salvage of the merchantable dead and distressed timber in accessible areas is recommended.

Table 34.--Trend of dying hemlock in Oregon and Washington, 1960-64

(In acres)

Year of detection	Area of damage		Regional total
	Oregon	Washington	
1960	2,000	33,120	35,120
1961	480	353,040	353,520
1962	1,280	223,680	224,960
1963	3,820	160,320	164,140
1964	0	203,460	203,460

Table 35.--Extent of dying hemlock in Washington in 1964, by reporting area and intensity of damage

Reporting area[1/]	Damage centers	Intensity of damage: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Washington:						
Mt. Baker N.F.	135	62,260	41,000	10,120	1,960	115,340
Olympic N.F.	28	47,050	13,780	0	0	60,830
Olympic N.P.	5	19,020	2,430	0	0	21,450
N.W. Washington (W.S.D.N.R.)	6	2,720	360	1,920	840	5,840
Washington areas	174	131,050	57,570	12,040	2,800	203,460

1/ N.F., National Forest; N.F., National Park; W.S.D.N.R., Washington State Department of Natural Resources.

TREE DAMAGE BY BEARS

Tree killing and tree damage caused by black bears decreased in both States (table 36). The most severe and widespread damage in Oregon occurred on the Northwest Oregon District and on and near the Willamette National Forest. In Washington the bear damage centers were located on or near the Olympic and Gifford Pinchot National Forests (table 37). Much of this type of damage is in already understocked stands.

A young tree girdled by bears.

Plot examinations by Gifford Pinchot National Forest personnel showed that bears killed or severely damaged between 16 percent and 46 percent of the trees in 18 to 40-year-old Douglas-fir and western hemlock stands. This loss left the stands much below the recommended stocking for the site and age classes.

Table 36.--Trend of tree damage caused by bears in western Oregon and western Washington, 1960-64

(In acres)

Year of detection	Area of damage		Regional total
	Oregon	Washington	
1960	33,720	18,980	52,700
1961	129,920	113,400	243,320
1962	109,700	27,405	137,105
1963	65,540	150,070	215,610
1964	53,290	73,280	126,570

Table 37.--Extent of tree damage caused by bears in Oregon and Washington in 1964, by reporting area and intensity of damage

Reporting area[1/]	Damage centers	Intensity of damage: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Oregon:						
Northwest Oregon (O.S.D.F.)	50	26,420	10,020	1,330	0	37,770
Willamette N.F.	15	6,080	800	320	0	7,200
Siuslaw N.F.	35	5,380	1,720	0	0	7,100
Mt. Hood N.F.	8	960	0	0	0	960
Umpqua N.F.	3	100	80	0	0	180
Siskiyou N.F.	2	80	0	0	0	80
Oregon areas	113	39,020	12,620	1,650	0	53,290
Washington:						
Olympic N.F.	55	28,060	3,890	440	0	32,390
Gifford Pinchot N.F.	25	9,580	8,800	160	680	19,220
Southwest Washington (W.S.D.N.R.)	22	8,860	2,160	1,370	0	12,390
Snoqualmie N.F.	10	5,660	900	200	0	6,760
Quinault I.R.	5	1,820	460	0	0	2,280
Yakima I.R.	1	240	0	0	0	240
Washington areas	118	54,220	16,210	2,170	680	73,280
Regional total	231	93,240	28,830	3,820	680	126,570

1/ N.F., National Forest; I.R., Indian Reservation; O.S.D.F., Oregon State Department of Forestry; W.S.D.N.R., Washington State Department of Natural Resources.

APPENDIX

Organization and Conduct of Aerial Surveys

Aerial surveys to detect outbreaks of important forest insects were a cooperative undertaking by Oregon State Department of Forestry and U. S. Forest Service in Oregon, and between Washington State Department of Natural Resources and the Forest Service in Washington. Detection survey flights were made in early June to detect larch casebearer damage in northeastern Washington. Regular detection surveys were made between July 6 and September 15. Special evaluation surveys were flown in October. Flying time for surveys this year totaled 299.9 hours (table 38).

Managing foresters accompanied the regular survey crews on the flights over their respective areas. This provided a good understanding of the size and intensity of the timber owner's forest pest problems.

Table 38.--Summary of cooperative aerial survey activities in 1964

Area covered	Timber area surveyed	Survey flight time: Mapping	Survey flight time: Ferry	Total
	M acres	Hours	Hours	Hours
Western Oregon	14,815 15,558	61.8	14.5	76.3
Eastern Oregon	12,492 14,881	71.4	12.5	83.9
Western Washington	13,069 13,061	59.5	11.1	70.6
Eastern Washington	11,660 9989	54.8	14.3	69.1
All areas	52,036 53,789	247.5	52.4	299.9

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation

Reporting area and insects involved 1/2/	Infestation: centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Central Oregon District and adjacent forest lands (O.S.D.F.):						
Fir engraver	6	510	200	0	0	710
Mountain pine beetle (P)	1	520	0	0	0	520
All insects	7	1,030	200	0	0	1,230

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation: centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Coos District and adjacent forest lands (O.S.D.F.):						
Balsam woolly aphid	3	280	240	0	0	520
Douglas-fir beetle	601	13,970	3,500	1,960	200	19,630
Mountain pine beetle (S)	2	80	4,520	0	0	4,600
Western pine beetle	7	2,170	0	0	0	2,170
All insects	613	16,500	8,260	1,960	200	26,960

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved [1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Crater Lake N.P.						
Balsam woolly aphid	8	920	400	0	0	1,320
Mountain pine beetle (L)	8	1,880	120	0	0	2,000
Mountain pine beetle (P)	1	200	0	0	0	200
Fir engraver	1	40	0	0	0	40
All insects	18	3,040	520	0	0	3,560

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Deschutes N.F. and adjacent forest lands:						
Needle miner, lodgepole pine	2	0	2,800	0	0	2,800
Balsam woolly aphid	54	8,240	7,600	1,480	0	17,320
Mountain pine beetle (L)	26	2,670	5,660	770	0	9,100
Western pine beetle	19	3,010	2,000	0	0	5,010
Mountain pine beetle (W)	9	1,200	0	440	0	1,640
Fir engraver	3	50	240	0	0	290
Oregon pine ips	4	150	0	0	0	150
Mountain pine beetle (P)	3	120	0	0	0	120
Mountain pine beetle (S)	1	40	0	0	0	40
All insects	121	15,480	18,300	2,690	0	36,470

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Fremont N.F. and adjacent forest lands:						
Fir engraver	62	29,690	8,400	960	0	39,050
Mountain pine beetle (L)	54	12,430	7,420	2,100	0	21,950
Western pine beetle	40	10,110	5,880	0	0	15,990
Mountain pine beetle (P)	15	1,500	1,320	100	0	2,920
Oregon pine ips	4	340	0	200	0	540
All insects	175	54,070	23,020	3,360	0	80,450

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Lookout Mt. (B.L.M.)						
Fir engraver	2	480	0	0	0	480
All insects	2	480	0	0	0	480

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Malheur N.F. and adjacent forest lands:						
Douglas-fir tussock moth	4	23,560	6,160	6,050	3,190	38,960
Western pine beetle	107	37,730	2,010	2,150	290	42,180
Mountain pine beetle (P)	23	3,770	1,540	1,420	0	6,730
Fir engraver	19	2,480	2,610	0	0	5,090
Oregon pine ips	17	710	550	550	390	2,200
Mountain pine beetle (L)	15	320	1,240	500	0	2,060
Douglas-fir beetle	8	680	130	0	0	810
All insects	193	69,250	14,240	10,670	3,870	98,030

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Mt. Hood N.F. and adjacent forest lands:						
Sawfly on larch	1	2,520	0	0	0	2,520
Balsam woolly aphid	58	15,400	2,260	0	0	17,660
Mountain pine beetle (W)	76	21,420	12,540	2,860	0	36,820
Oregon pine ips	7	950	50	0	0	1,000
Douglas-fir beetle	5	450	0	0	0	450
Fir engraver	1	120	0	0	0	120
Mountain pine beetle (P)	1	30	0	0	0	30
All insects	149	40,890	14,850	2,860	0	58,600
Bear damage	8	960	0	0	0	960
All damage	157	41,850	14,850	2,860	0	59,560

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All Intensities
	Number	Acres				
Northwest Oregon District and adjacent forest lands (O.S.D.F.):						
Balsam woolly aphid	2	20	0	0	0	20
All insects	2	20	0	0	0	20
Bear damage	50	26,420	10,020	1,330	0	37,770
Total	52	26,440	10,020	1,330	0	37,790

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Ochoco N.F. and adjacent forest lands:						
Douglas-fir tussock moth	5	1,360	0	0	0	1,360
Western pine beetle	52	16,870	0	0	0	16,870
Fir engraver	36	9,490	440	0	0	9,930
Mountain pine beetle (P)	9	1,340	0	0	0	1,340
Oregon pine ips	6	740	0	0	0	740
Douglas-fir beetle	3	470	0	0	0	470
All insects	111	30,270	440	0	0	30,710

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved [1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Rogue River N.F. and adjacent forest lands:						
Balsam woolly aphid	16	14,760	2,720	1,120	160	18,760
Mountain pine beetle (P)	5	1,760	0	0	80	1,840
Western pine beetle	3	1,180	0	0	0	1,180
Fir engraver	7	1,170	0	0	0	1,170
Mountain pine beetle (L)	3	1,100	0	0	0	1,100
Oregon pine ips	3	880	0	0	0	880
Mountain pine beetle (S)	3	490	0	0	0	490
Douglas-fir beetle	2	240	0	0	0	240
Mountain pine beetle (W)	2	190	0	0	0	190
Cedar bark beetle (Incense cedar)	2	20	0	0	0	20
All insects	46	21,790	2,720	1,120	240	25,870

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Siskiyou N.F. and adjacent forest lands:						
Douglas-fir beetle	141	5,610	740	330	80	6,760
Mountain pine beetle (W)	3	4,340	0	0	0	4,340
Western pine beetle	10	3,120	0	0	0	3,120
Mountain pine beetle (P)	15	1,480	120	0	0	1,600
Mountain pine beetle (S)	6	1,030	0	0	0	1,030
Mountain pine beetle (L)	2	190	0	0	0	190
All insects	177	15,770	860	330	80	17,040
Bear damage	2	80	0	0	0	80
Total	179	15,850	860	330	80	17,120

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Siuslaw N.F. and adjacent forest lands:						
Noctuid moth, Douglas-fir	2	0	8,440	0	0	8,440
Western oak looper	22	5,670	640	120	0	6,430
Balsam woolly aphid	1	340	0	0	0	340
Douglas-fir beetle	290	17,790	100	0	0	17,890
All insects	315	23,800	9,180	120	0	33,100
Bear damage	35	5,380	1,720	0	0	7,100
Total	350	29,180	10,900	120	0	40,200

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation: centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Steens Mt. (B.L.M.)						
Fir engraver	1	200	0	0	0	200
All insects	1	200	0	0	0	200

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Umatilla I.R.:						
Fir engraver	2	180	0	0	0	180
Mountain pine beetle (P)	1	80	0	0	0	80
All insects	3	260	0	0	0	260

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	- - - - - - - - - - - - Acres - - - - - - - - - - - -				
Umatilla N.F. and adjacent forest lands:						
Fir engraver	111	21,940	1,660	440	0	24,040
Douglas-fir beetle	73	9,400	1,240	0	0	10,640
Western pine beetle	37	8,170	0	0	0	8,170
Mountain pine beetle (P)	20	4,330	350	0	0	4,680
Engelmann spruce beetle	6	780	60	0	0	840
Mountain pine beetle (L)	4	530	0	0	0	530
All insects	251	45,150	3,310	440	0	48,900

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Umpqua N.F. and adjacent forest lands:						
Balsam woolly aphid	42	12,640	3,410	1,810	100	17,960
Mountain pine beetle (W)	38	5,990	80	0	0	6,070
Douglas-fir beetle	9	2,360	0	0	0	2,360
Western pine beetle	3	140	600	0	0	740
Mountain pine beetle (L)	2	160	0	0	0	160
All insects	94	21,290	4,090	1,810	100	27,290
Bear damage	3	100	80	0	0	180
Total	97	21,390	4,170	1,810	100	27,470

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Wallowa-Whitman N.F. and adjacent forest lands:						
Sawfly on larch	2	160	0	0	0	160
Douglas-fir beetle	201	31,960	16,060	4,200	0	52,220
Fir engraver	89	29,560	6,560	0	0	36,120
Mountain pine beetle (P)	48	12,360	5,160	2,320	1,560	21,400
Western pine beetle	18	5,480	0	0	0	5,480
Engelmann spruce beetle	21	2,160	600	0	0	2,760
Mountain pine beetle (L)	5	1,360	0	0	80	1,440
Oregon pine ips	12	40	0	0	0	40
All insects	396	83,080	28,380	6,520	1,640	119,620

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved [1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Warm Springs I.R.						
Balsam woolly aphid	7	1,380	0	0	0	1,380
Western pine beetle	5	440	0	0	0	440
Mountain pine beetle (W)	2	200	0	0	0	200
Mountain pine beetle (P)	2	70	0	0	0	70
All insects	16	2,090	0	0	0	2,090

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Willamette N.F. and adjacent forest lands:						
Balsam woolly aphid	136	63,200	8,680	880	0	72,760
Mountain pine beetle (W)	137	20,720	13,200	8,800	720	43,440
Douglas-fir beetle	7	640	80	0	0	720
Mountain pine beetle (L)	1	0	0	0	160	160
All insects	281	84,560	21,960	9,680	880	117,080
Bear damage	15	6,080	800	320	0	7,200
Total	296	90,640	22,760	10,000	880	124,280

See footnotes at end of table.

Table 39.--Extent of infestations in Oregon in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Winema N.F. and adjacent forest lands:						
Mountain pine beetle (L)	55	8,310	6,410	1,660	720	17,100
Western pine beetle	26	9,790	170	0	0	9,960
Fir engraver	8	2,110	1,130	0	160	3,400
Oregon pine ips	9	840	700	0	280	1,820
Mountain pine beetle (P)	3	890	0	20	0	910
All insects	101	21,940	8,410	1,680	1,160	33,190

1/ Mountain pine beetle damage has been separated by tree species attacked: L, lodgepole pine; P, ponderosa pine; S, sugar pine; W, western white pine.

2/ Reporting areas are abbreviated as follows: N.F., National Forest; I.R., Indian Reservation; N.P., National Park; O.S.D.F., Oregon State Department of Forestry; B.L.M., Bureau of Land Management.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation

Reporting area and insects involved [1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Colville I.R.						
Western pine beetle	9	2,120	0	0	0	2,120
Mountain pine beetle (P)	8	2,070	0	0	0	2,070
Douglas-fir beetle	13	1,460	590	0	0	2,050
Oregon pine ips	7	410	330	0	0	740
Mountain pine beetle (L)	1	0	180	0	0	180
Fir engraver	1	80	0	0	0	80
All insects	39	6,140	1,100	0	0	7,240

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Colville N.F. and adjacent forest lands:						
Douglas-fir tussock moth	22	2,200	1,060	180	0	3,440
Spruce budworm	2	230	510	0	0	740
Larch casebearer	1	200	0	0	0	200
Douglas-fir beetle	26	2,530	1,900	200	0	4,630
Mountain pine beetle (W)	11	1,640	1,000	1,050	0	3,690
Mountain pine beetle (L)	3	670	1,130	1,740	0	3,540
Mountain pine beetle (P)	6	690	0	1,840	0	2,530
Western pine beetle	3	260	510	150	0	920
Fir engraver	3	230	260	0	0	490
Oregon pine ips	3	330	0	0	0	330
All insects	80	8,980	6,370	5,160	0	20,510

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Gifford Pinchot N.F. and adjacent forest lands:						
Balsam woolly aphid	53	17,900	5,560	2,400	0	25,860
Mountain pine beetle (W)	55	16,880	10,870	3,550	0	31,300
Western pine beetle	4	2,400	0	0	0	2,400
Mountain pine beetle (L)	2	680	200	0	0	880
Mountain pine beetle (P)	1	160	0	0	0	160
Douglas-fir beetle	5	460	0	0	0	460
All insects	120	38,480	16,630	5,950	0	61,060
Bear damage	25	9,580	8,800	160	680	19,220
Total	145	48,060	25,430	6,110	680	80,280

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation: centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Glenwood District and adjacent forest lands (W.S.D.N.R.):						
Western pine beetle	4	840	0	0	0	840
Mountain pine beetle (P)	2	520	0	0	0	520
Oregon pine ips	4	520	0	0	0	520
All insects	10	1,880	0	0	0	1,880

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Kaniksu N.F. and adjacent forest lands:						
Larch casebearer	31	13,820	9,420	3,000	3,940	30,180
Spruce budworm	1	1,310	440	310	0	2,060
Mountain pine beetle (W)	24	7,320	2,970	150	0	10,440
Fir engraver	7	2,510	330	0	0	2,840
Douglas-fir beetle	8	230	130	0	0	360
All insects	71	25,190	13,290	3,460	3,940	45,880

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Mt. Baker N.F. and adjacent forest lands:						
Mountain pine beetle (W)	36	1,590	920	1,760	0	4,270
Silver fir beetles	1	0	520	0	0	520
Fir engraver	2	0	280	0	0	280
All insects	39	1,590	1,720	1,760	0	5,070
Dying hemlock	135	62,260	41,000	10,120	1,960	115,340
Total	174	63,850	42,720	11,880	1,960	120,410

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Mt. Rainier N.P.:						
Balsam woolly aphid	6	640	0	480	0	1,120
Mountain pine beetle (W)	18	1,480	1,000	1,440	320	4,240
All insects	24	2,120	1,000	1,920	320	5,360

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Northeast Washington District and adjacent forest lands (W.S.D.N.R.):						
Larch casebearer	31	46,980	19,120	11,900	4,530	82,530
Douglas-fir tussock moth	50	5,380	3,530	4,150	1,200	14,260
Mountain pine beetle (W)	4	720	0	0	0	720
All insects	85	53,080	22,650	16,050	5,730	97,510

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved [1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
orthwest Washington and Puget Sound Districts and adjacent forest lands (W.S.D.N.R.):						
Mountain pine beetle (W)	3	1,420	140	0	0	1,560
Dying hemlock	6	2,720	360	1,920	840	5,840
All damage	9	4,140	500	1,920	840	7,400

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Okanogan N.F. and adjacent forest lands:						
Douglas-fir beetle	36	6,450	380	0	0	6,830
Mountain pine beetle (P)	16	2,660	2,050	1,540	230	6,480
Western pine beetle	10	2,970	840	0	0	3,810
Fir engraver	18	2,970	540	0	0	3,510
Mountain pine beetle (L)	6	1,100	790	280	0	2,170
Engelmann spruce beetle	3	280	0	0	0	280
Mountain pine beetle (W)	1	130	0	0	0	130
All insects	90	16,560	4,600	1,820	230	23,210

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved [1/2/]	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Olympic N.F. and adjacent forest lands:						
Mountain pine beetle (W)	31	7,830	6,020	1,840	180	15,870
Bear damage	55	28,060	3,890	440	0	32,390
Dying hemlock	28	47,050	13,780	0	0	60,830
All damage	83	75,110	17,670	440	0	93,220
Total	114	82,940	23,690	2,280	180	109,090

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Olympic N.P.						
Mountain pine beetle (W)	61	39,730	12,110	4,790	640	57,270
Silver fir beetles	1	150	0	0	0	150
Douglas-fir beetle	1	80	0	0	0	80
All insects	63	39,960	12,110	4,790	640	57,500
Dying hemlock	5	19,020	2,430	0	0	21,450
Total	68	58,980	14,540	4,790	640	78,950

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Quinault I.R.:						
Mountain pine beetle (W)	3	2,050	0	130	0	2,180
Bear damage	5	1,820	460	0	0	2,280
Total	8	3,870	460	130	0	4,460

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Snoqualmie N.F. and adjacent forest lands:						
Balsam woolly aphid	24	4,320	1,320	160	0	5,800
Mountain pine beetle (W)	53	16,120	4,920	1,360	240	22,640
Fir engraver	3	840	0	0	0	840
Silver fir beetles	4	560	0	0	0	560
Douglas-fir beetle	2	230	0	0	0	230
Oregon pine ips	1	10	0	0	0	10
All insects	87	22,080	6,240	1,520	240	30,080
Bear damage	10	5,660	900	200	0	6,760
Total	97	27,740	7,140	1,720	240	36,840

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Spokane I.R.						
Western pine beetle	4	950	330	0	0	1,280
Oregon pine ips	4	150	50	0	0	200
All insects	8	1,100	380	0	0	1,480

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/ 2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Southwest Washington Districts and adjacent forest lands (W.S.D.N.R.):						
Balsam woolly aphid	1	1,040	0	0	0	1,040
Western hemlock looper	8	330	320	0	0	650
All insects	9	1,370	320	0	0	1,690
Bear damage	22	8,860	2,160	1,370	0	12,390
Total	31	10,230	2,480	1,370	0	14,080

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Umatilla N.F. and adjacent forest lands: (Wn. portion)						
Fir engraver	15	4,000	0	0	0	4,000
Douglas-fir beetle	23	2,710	0	0	0	2,710
Mountain pine beetle (P)	5	1,270	0	0	0	1,270
Western pine beetle	2	510	0	0	0	510
Engelmann spruce beetle	3	320	0	0	0	320
Oregon pine ips	3	120	0	0	0	120
All insects	51	8,930	0	0	0	8,930

See footnotes at end of table.

Table 40.--Extent of infestations in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Wenatchee N.F. and adjacent forest lands;						
Balsam woolly aphid	2	720	0	0	0	720
Mountain pine beetle (W)	98	11,860	4,800	3,860	120	20,640
Fir engraver	26	1,820	1,040	0	0	2,860
Mountain pine beetle (L)	2	1,120	680	0	0	1,800
Western pine beetle	14	1,660	80	0	0	1,740
Douglas-fir beetle	7	480	280	0	0	760
Oregon pine ips	2	80	80	0	0	160
Mountain pine beetle (P)	1	0	0	0	120	120
All insects	152	17,740	6,960	3,860	240	28,800

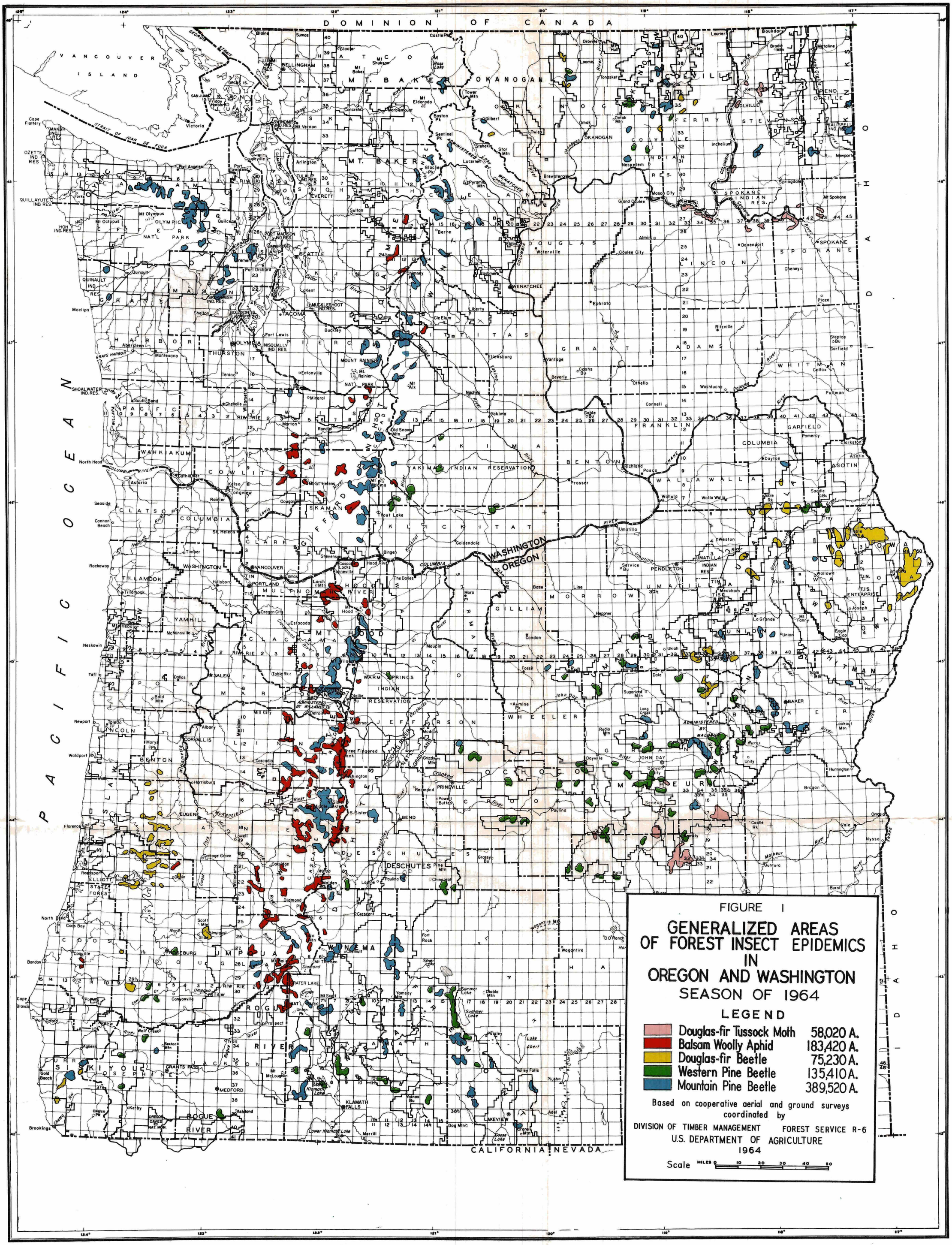
See footnotes at end of table.

Table 40.--Extent of infestation in Washington in 1964, by forest area, insect species, and intensity of infestation (Cont.)

Reporting area and insects involved 1/2/	Infestation centers	Intensity of infestation: Light	Moderate	Heavy	Very heavy	All intensities
	Number	Acres				
Yakima I.R.:						
Balsam woolly aphid	2	440	400	0	0	840
Western pine beetle	21	9,520	960	0	0	10,480
Mountain pine beetle (W)	5	240	240	560	0	1,040
Mountain pine beetle (P)	2	520	160	0	0	680
Mountain pine beetle (L)	1	0	200	0	0	200
Fir engraver	1	320	0	0	0	320
All insects	32	11,040	1,960	560	0	13,560
Bear damage	1	240	0	0	0	240
Total	33	11,280	1,960	560	0	13,800

1/ Mountain pine beetle damage has been separated by tree species attacked: L, lodgepole pine; P, ponderosa pine; W, western white pine.

2/ Reporting areas are abbreviated as follows: N.F., National Forest; I.R., Indian Reservation; N.P., National Park; W.S.D.N.R., Washington State Department of Natural Resources.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Mt. Rainier Nat'l Park
Ellensburg
Vantage
Beverly
Cashs Bu
Othello
Ritzville
Adams
Grant
Whitman
Garfield
Columbia
Asotin
Franklin
Pullman
Colfax
Steptoe Bu
Garfield
Tenino
Eatonville
Mineral
Cheholis
South Bend
Shoalwater Ind. Res.
Willapa Bay
Chehalis
Yakima
Naches
Cornell
Gable Bu
Washtucna
Old Snowy Mtn
Randle
Morton
Wahkiakum
Cowlitz
Clatsop
Columbia
Skamania
Klickitat
Yakima Indian Reservation
Benton
Richland
Pasco
Prosser
Walla Walla
Wallula
Dayton
Asotin
Saddle Bu
Table Rk
Troy
Tenmile Rk
Weston
Umatilla
Pendleton
Service Bu
Umatilla Indian Res.
Meacham
Elgin
Wallowa
T.I.S. Enterprise
Joseph
Eagle Cap
Mt Fanny
La Grande
Union
Cove
Alder Slope
Hilgard
Halfway
Table Mtn
Lookout Mtn
Baker
Pine
Burnt
Unity
Huntington
Brogan
Ontario
Vale
Nyssa
Juntura
Malheur
Castle Rk
Dayville
John Day
Canyon City
Long Creek
Sugarloaf Mtn
Dale
Ukiah
Fossil
Condon
Maupin
Heppner
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Morrow
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Lake
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Jefferson
Crook
Wheeler
Mt Jefferson
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Table Rk
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Multnomah
Clark
Skamania
Klickitat
Yakima
Kittitas
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Clark
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Klickitat
Yakima
Kittitas
Benton
Franklin
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Columbia
Garfield
Asotin
Whitman
Adams
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